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ABSTRACT

The features of a mass production-based economy are traced and contrasted within a competitive global marketplace in this political-economic analysis. The early reform movement's equation of "more" with "better" is no longer appropriate to meet the human resource needs of a nation undergoing profound economic changes. Older industrial economies such as the United States have two options: stabilize mass production by cutting costs, or increase the value of labor. Each path requires a different organization of work and type of work force. The second path relies on a work force capable of rapid learning in order to compete successfully in the world market. To prepare the nation's labor force, American education faces four challenges: (1) improve basic literacy and numeracy skills; (2) promote collaboration between specialized disciplines; (3) encourage teacher and student responsibility; and (4) avoid fragmentation of elite/less privileged groups. (22 references) (LMI)

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EDUCATION AND THE NEXT ECONOMY

ROBERT B. REICH

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Education and the Next Economy,
by Robert B. Reich **April 1988**

Robert Reich, political economist, traces the fundamental features of an economy based on mass production and contrasts it with a competitive economy within the global marketplace. He stresses the importance of basic numerical skills, literacy, critical thinking, and collaboration among workers in increasing the ability of the labor force to compete successfully. Education and the NEA, he suggests, have major roles to play in enhancing the value of the U.S. labor force. 28 pp.

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Contents

Foreword 5

Introduction 7

The Current Mess 9

Work in the Old Economy 11

Enter the Global Economy 13

The Organization of Work: Two Paths to the Next Economy 15

The New Educational Challenge 17

Basic Numeracy and Literacy 19

Responsibility 21

Collaboration 23

The Danger of Fragmentation 25

Notes 27

Foreword

Since the 1983 publication of *A Nation at Risk*, proposals to reform public education have been ushered in at a breathtaking pace. Often composed with more of an eye to their political appeal than to their capacity to promote meaningful change, many of these early reform proposals can be summed up in a single word, *more*—more mathematics, more science, more grammar, more time spent in school. According to reformers, *more* would eventually translate into *higher*—higher test scores, higher graduation rates, higher literacy rates.

While many of the early goals of education reform (if not necessarily the means of attaining them) appeared desirable, simply to wish for more seemed inadequate. Within the NEA, there exists a strong perception that education needs to be different as well as enhanced. The basis of this perception is to be found to a certain extent in the profound economic changes that lie ahead for our nation. With intensifying global economic competition and a national economy increasingly oriented toward services and information, the work force will have to possess higher-order thinking skills and be able to work cooperatively, in addition to being both literate and numerate. An education system that developed in response to the need to prepare large numbers of people for routinized jobs in American industry does not now hold much promise for meeting that challenge.

Much has been written about the emerging economy and the significant advantages of new forms of work organization. However, we discovered that little serious scholarship existed on how education might be most profitably restructured in order to meet the human resource needs of this new economy. The National Education Association asked Robert B. Reich, a noted political economist and the author of major works concerned with the organization of the American economy, to help us chart a course in this largely unexplored territory. *Education and the Next Economy* is the product of that request.

This essay traces the fundamental features of the old economy based on mass production and contrasts it with the type of economy we will need to compete in, within the global marketplace. We are shown in vivid terms how the education system that supports an economy based on mass production will prove to be inadequate in supporting what Professor Reich terms the "next economy." In order to address our future economic needs, Mr. Reich develops a provocative series of themes for the future of public education that point to some of the critical areas of development.

We can no longer afford to presume that politically expedient solutions will be sufficient to meet the demands of tomorrow. In this pathbreaking work, Mr. Reich instructs us on how we as an organization and as educators might contribute to creating a healthy and equitable national economy. At the same time, it is an invitation to members of the business and political communities, who are concerned with the critical relationship between education and the economy, to share their perceptions and ideas with us as we move into the next era of American education. Just as the next economy will require higher levels of cooperation, so also will the work we will have to do in order to bring it about. If we are to make changes on the order that this work portends, it will have to be a cooperative effort.

April 1988

Introduction

What kind of education will Americans need in the emerging economy? The conventional view is that Americans will need *more* and *better* education, but there is surprisingly little agreement about what *more* and *better* actually mean. The answer should not depend on occupational projections—that is, on estimates about which jobs are likely to be plentiful should the economy continue in the direction it is now moving—for that direction is toward a continuing decline in the living standard of most Americans. We first need to define where we want our economy to go, and then ask what kind of education will help to propel us in that direction.

The purpose of this essay is to explore where the economy is heading, where it should be heading, and what education can and should contribute. Its modest goal is to provide a framework for continuing discussion about these vital matters. By focusing on the relationship between education and the next economy, I do not mean to suggest that education's only, or most important, purpose is economic. To the contrary: A truly educated person is motivated by, and can find satisfaction in, a wide array of things that are not traded in markets or that cost very little. A just and democratic society depends on a citizenry educated in civic responsibility rather than in economic aggrandizement.[1]

The Current Mess

THE STOCK MARKET crashed on October 19, 1987, but the deterioration of the American economy had begun long before. America has been busy consuming more than it has produced. In 1986, for example, the nation generated some $800 billion more in goods and services than it had in the recession year of 1982, but it spent about $900 billion more.

We have been able to ignore this profligacy only because foreigners have kept lending us money, buying our corporations, and purchasing our real estate. By the time of the crash, we were $350 billion in debt, almost one-half of the commercial real estate of downtown Los Angeles (among many other cities) was in foreign hands, and foreign creditors were growing sufficiently nervous about our ability to repay our debts that the dollar was heading downward.

A nation living beyond its means faces precisely the same choice as a person living in the same manner; either it may grow poorer, or it may improve its means by becoming more productive. America has been exercising the first option. The steadily declining dollar has rendered more expensive everything we purchase from abroad; in most families, two wage-earners are necessary to make ends meet, whereas years ago one would do; average family size is shrinking; young people are having difficulty affording houses nearly as nice as the homes they grew up in; for the first time since the 1930s the percentage of Americans who own their own homes is declining; over one-fifth of our children are now born into poverty. The average American family is no better off today than it was fifteen years ago, even though America is now living off borrowed funds. Were the borrowing to stop, our standard of living would fall precipitously.

As the present work force matures, moreover, the first option (to grow poorer) becomes ever more likely. The number of American young people is declining while retirees are increasing. By the year 2030, when the proportion of our population 65 years of age and older will nearly have doubled from what it is now, the number of workers supporting each retiree will have dropped from 3.3 to a bit over 2. Unless each remaining worker becomes far more productive than now (or unless retirees continue to work long after retirement age, or unless we allow into America large numbers of new immigrants), our average citizen will have to get by on a much smaller income.

The second option (becoming more productive) has been pursued less vigorously. Our indebtedness to the rest of the world would not be alarming were the proceeds invested in our future productivity, but such has not been the case. Net investment in plant and equipment, as a percentage of gross national product, has been no higher in the 1980s than in the perilous 1970s, supply-side predictions to the contrary notwithstanding. Meanwhile, public investments have lagged. Government spending on commercial research and development has declined 95 percent from its level two decades ago; even when added to private-sector research and development, the total is still less than 2 percent of GNP, lower than comparable research and development expenditures in all other advanced industrial nations. Spending to upgrade and expand the nation's infrastructure—the roads, bridges, ports, tunnels, and com-

munications facilities through which our commerce travels—has dropped from 2.3 percent of GNP two decades ago to 0.4 percent today. Federal support for education, job-training, and preschool care has declined as well.

Thus, while manufacturing productivity has risen slightly as a result of advances in automation and efforts at cutting costs, overall productivity gains, weighed down by slow or negative gains in the increasingly important service sector, have dropped to only 1 percent a year, from over 3 percent a decade before. In the last two years, even a declining dollar has barely helped American producers regain market share from foreigners who continue to supply world markets with relatively cheap, high-quality goods. At this rate the dollar will have to drop significantly lower if the trade balance is to be restored.

Most of the panaceas now being offered by politicians and business leaders are alternative means of growing poorer—for example, allowing the dollar to continue to fall, cutting wages, reducing environmental and safety regulations, slashing welfare expenditures, protecting American goods from foreign competition, and even bringing on a recession. These strategies impose the burden of becoming poorer on different groups of citizens over slightly different periods of time, but their overall effects are much the same. There is no secret to becoming poorer. To repeat: The *only* becoming-richer strategy is to become more productive—adding ever-greater value to the world economy.

Work in the Old Economy

PRODUCTIVITY, HOWEVER, IS no longer simply a matter of making more of what we already make at less cost per unit. To add greater value to the world economy, we have to provide higher quality goods, and tailor our products and services to the particular needs of consumers. This is a new challenge, entailing a very different organization of work.

In the early postwar years, most young people could look forward to jobs requiring only that they be able to learn some relatively simple tasks that could be repeated, over and over. That's because the American economy was organized around economies of scale. The goal was high-volume, standardized production in which large numbers of identical items could be produced over long runs, allowing fixed costs to be spread as widely as possible. Whether it was wheat, steel, or even insurance, the same overarching rule prevailed: Every step along the production process was to be simple and predictable, so that it could be synchronized with every other step. Productivity was a function of high volume and low cost.

There was little room or need for innovation. Once in a while someone came up with a major invention—e.g., continuous casters for making steel, automobile stamping machines, plastics—but these big breakthroughs were relatively few and far between. Indeed, innovation often was seen as a problem rather than as a solution. Innovation meant changes in products and production processes, and such changes cost money. If the changes happened too often, it was difficult to achieve the economies of scale necessary to pay for them and still make a profit.

Sometimes competitors quietly agreed not to innovate very much for fear of rocking the profitable boat. These were the days when most industries were dominated by a few large companies—the Big Three automakers, a handful of steel producers, three or four major food processors—who roughly coordinated prices and investments in order to achieve the kind of stability and predictability necessary for vast economies of scale. The tailfins on our cars grew longer, but underneath the hoods the autos remained about the same year after year, and it didn't matter very much which brand you bought.[2]

Under high-volume, standardized production, a few people at the top made all the decisions. They designed the system and planned all the standard operating procedures by which it would run. Most people followed orders. Indeed, for the production system to be stable and predictable, the majority had to follow orders exactly. Rigid work rules and job classifications posed no challenge to this hierarchical system, because every job was rigid to begin with—like cogs in a wheel.

A primary goal of public education within this stable system was to prepare most young people for such "cog" jobs. They had to be trained to comprehend and accept instructions, and then to implement them conscientiously. Discipline and reliability were core virtues.

A much smaller number of young people had to be prepared to act as decision makers at the top. They needed to be trained to gather information, translate the information into abstract symbols, manipulate the symbols to find answers, turn the answers into operating instructions, and then communicate the instructions

downward. Here, abstract logic, clarity, and firmness were the core virtues.

Our schools were reasonably effective at preparing Americans for these two kinds of jobs. Most children graduated from high school or vocational school ready to accept cog jobs. A few were set on an advanced track through high school and into colleges that prepared them either for careers as professional managers or for the related professions of law, banking, engineering, and consulting. Productivity soared.[3]

Enter the Global Economy

HIGH-VOLUME, STANDARDIZED production can no longer provide the productivity gains we need to maintain our standard of living. There has been a sea change in the world economy. Beginning in the 1960s and continuing to the present day, the cost of sending things or information around the globe has fallen dramatically. This is a result, principally, of rapid advances in the technologies of transporting and communicating—of innovations such as container ships, satellites, and computers that allowed the production process to be fragmented and parceled out around the globe to wherever pieces of it could be undertaken most cheaply and efficiently. Until recently most goods were produced close to where they were to be consumed; the main exceptions were certain minerals, agricultural goods, and economically unimportant exotica. This pattern has been breaking down at an increasing pace. Consumers of cars, refrigerators, televisions and television programs, insurance policies, and even money, often live in different nations or on different continents from the producers. The producers, in turn, often depend on far-distant sources for components, designs, and information. It is now often cheaper to ship raw steel across an ocean than across the United States. Slight differences in interest rates may induce a New York corporation to raise money in Tokyo or in Bonn instead of on Wall Street.

Two decades ago international trade hardly figured in the American market; today, more than 70 percent of the goods we produce are actively competing with foreign-made goods. Whoever can do it best and cheapest, anywhere in the world, now sells to whoever is willing to pay the best price, anywhere in the world. The elegant curves of supply and demand that so charm economists are meeting up in the oddest of places.

In a world where routine production is footloose and billions of potential workers are ready to underbid American labor, we can no longer expect to be competitive by simply producing more of the same thing we produced before, at lower cost. As the production of commodities shifts to other nations, America's competitive advantage correspondingly must shift toward work whose value is based more on quality, flexibility, precision, and specialization than on its low cost. For example, only a small fraction of the American work force is still employed on the farm. But the food industry nevertheless accounts for close to one-quarter of the jobs in the United States. That's because most of what Americans and consumers in other advanced nations now spend for food goes to the people who process, package, market, and retail it, and to the agricultural epidemiologists, geneticists, international bankers, commodity traders, chemists, and process engineers who supply the technology and money for producing it, rather than to those who actually grow and harvest it. Similarly, most of what is spent on appliances, clothing, cars, computers, air travel, or a host of other things is for designing, engineering, fabricating, and advertising, rather than for standardized, routine work. In fact, much of the growth in what has been termed services within the American economy is attributable to just such businesses.

Nor can we hope to be competitive by relying, as before, on major inventions that occur from time to time. These days, breakthrough inventions get away. Americans continue to lead the world in big breakthroughs and cutting-edge scientific discoveries. But the big ideas that start in this country now quickly travel abroad, where they get produced at high speed, at low cost, and with great efficiency. All too often, Americans get bogged down somewhere between invention and production. We fail to incorporate new ideas into our products and processes nearly as fast as we should. Several product histories make the point. Americans invented the solid-state transistor in 1947. Then in 1953, Western Electric licensed the technology to Sony for $25,000—and the rest is history. A few years later, RCA licensed several Japanese companies to make color televisions—and that was the beginning of the end of color television production in the United States. Routine assembly of color televisions eventually shifted to Taiwan and Mexico. Americans came up with video recorders, basic oxygen furnaces, microwave ovens, and computerized machine tools. But these big ideas and many others found their way into routine, standardized production in other nations.[4]

Keeping a technology requires elaborating upon it continuously, developing variations and small improvements in it that better meet particular needs. Where innovation is continuous, and products are ever more tailored to customers' needs, the distinction between goods and services further blurs. Thus when robots and computerized machine tools are linked through software that allows them to perform unique tasks, customer service becomes a part of production. When a new alloy is molded to be a specified weight and tolerance, service accounts for a significant part of the value added.

Reports that American workers can no longer compete in manufacturing and must shift to services are thus only half right. More precisely, they can keep high wages only by producing goods with a large component of specialized services, or to state the same thing differently, by providing services integral to the production and use of specific goods. There is no longer any meaningful distinction between the two categories, goods and services.

The point is this: In the new global economy, nearly everyone has access to big breakthroughs and to the machines and money to turn them into standardized products at about the same time, and on roughly the same terms. The only factor of production that is relatively immobile internationally, and on which the future standard of living of the nation uniquely depends, is *us*—our competence, our insights, our capacity to work productively together.

The older industrial economies like America thus have two options: (1) they can try to match the wages for which workers elsewhere are willing to labor, or (2) they can compete on the basis of how quickly and how well they can transform ideas into incrementally better goods and services. Both paths can boost profits and improve competitiveness in the short run, but only the second can maintain and improve the standard of living of most Americans over time.

The Organization of Work: Two Paths to the Next Economy

THE FIRST PATH—toward stable mass production—relies on cutting labor costs, and leaping into wholly new product lines as old ones are played out. For managers this path has meant undertaking (or threatening) massive layoffs, moving (or threatening to move) to lower-wage states and countries, parceling out work to lower-cost suppliers, automating to cut total employment, and diversifying into radically different goods and services. For workers this path has meant defending existing jobs and pay scales, grudgingly conceding lower wages and benefits, shifting burdens by accepting lower-pay scales for newly hired workers, seeking protection from foreign competition, and occasionally striking.

The second path involves increasing labor's *value*. For managers this path means continuously retraining employees for more complex tasks, automating in ways that cut routine tasks and enhance worker flexibility and creativity, diffusing responsibility for innovation, taking seriously labor's concern for job security and giving workers a stake in improved productivity via profit-linked bonuses and stock plans. For workers this second path means accepting flexible job classifications and work rules, agreeing to wage rates linked to profits and productivity improvements, and generally taking greater responsibility for the soundness and efficiency of the enterprise. The second path also involves a close and more permanent relationship with other parties that have a stake in the firm—suppliers, dealers, creditors, even the towns and cities in which the firm resides. On this second path, all those associated with the firm become partners in its future, sharing downside risks and upside benefits. Each member of the enterprise participates in its evolution. All have a commitment to its continued success.

The second path requires a fundamentally different organization of work from that which has come before, as well as a different work force within that new organization. The old hierarchical arrangement in which a relatively few well-trained individuals planned and maintained the production system from the top, and almost everyone else undertook cog jobs below, is not up to the challenge. The technologies upon which we must continuously improve, and the tastes to which we must continuously respond, are changing so rapidly that no set of decision makers at the top can hope to keep up. Much of the relevant information lies below—among production workers, production engineers, sales people and others in direct contact with suppliers, production processes, and customers. There is not enough time for all the relevant information to be passed upward to the top decision makers and then down again in the form of new operating instructions. With valuable information and expertise dispersed throughout the organization, top managers cannot hope to solve problems and provide answers; their jobs must be to create environments in which people can identify and solve problems for themselves.

Thus the division between workers and managers will blur. Because production is a continuous process of reinvention, efforts will focus on many thousands of small ideas rather than on just a few big ones. Small-scale innovations will occur everywhere in the organization—and must occur quickly and continuously, in response to changing opportunities. One idea should lead to another. Producing the latest generation of automobiles involves making electronic circuits that govern fuel consumption and monitor engine performance; developments in these devices might lead to improved sensing equipment and software for monitoring heartbeats and moisture in the air. Producing cars also involves making flexible robots for assembling parts and linking them by computer; steady improvements in these technologies, in turn, may lead to expert production systems that can be applied anywhere. What is considered to be an "automobile manufacturer" thus is transmuted into a broad collection of skills evolving toward all sorts of applications that flow from the same strand of technological development.

Ideally, individual skills are integrated into a group; this collective capacity to innovate becomes something greater than the sum of its parts. Over time, as group members work through various problems and approaches, they learn about each others' abilities. They learn how they can help one another perform better, what each can contribute to a particular project, and how they can best take advantage of one another's experience. Each participant is on the lookout for small adjustments that will speed and smooth the evolution of the whole. The net result of many such small-scale adaptations, effected throughout the organization, is to propel the enterprise forward.

Workers also learn how they can better meet customers' needs: Sales people no longer simply "sell" goods and services. They help customers clarify and redefine what they need, and devise new solutions based upon what the firm might potentially provide. Thus sales people must have a complete understanding of the enterprise's capacity to design and deliver specialized products; and designers and engineers must be equally familiar with sales and marketing. In short, the firm's ability to adapt to new opportunities and capitalize on them depends on the capacities of all of its employees to share information and involve themselves in a system-wide search for ways to improve, adjust, adapt, and upgrade.

As workers add value through judgment and knowledge, computers become tools that expand their discretion rather than further simplify their jobs. Computer-generated information can give workers rich feedback about their own efforts, how they affect others in the production process, and how the entire process can be improved. One of the key lessons to emerge from the General Motors–Toyota joint venture in California is that the Japanese automaker does not rely on automation and technology to replace workers in the plant. In fact, human workers still occupy the most critical jobs—those where judgment and evaluation are essential. Instead, Toyota uses technology to allow workers to focus on those important tasks where choices have to be made. Under this approach, technology gives workers the chance to use their imagination and their insight on behalf of the company.

The New Educational Challenge

THE SECOND PATH to the next economy—increasing the value of labor rather than cutting its costs—relies, above all, on a work force capable of rapid learning. The most important skills will be transferred informally among workers as they gain experience on the job, rather than gleaned through formal education and training. But the ability to learn on the job will depend on learning skills and attitudes developed long before.

The old system of education mirrored the old organization of production: Most people spent eight to twelve years of their childhood training for cog jobs, while a few were propelled toward top policy and planning positions. The new system must prepare far more people to take responsibility for their continuing education, and to collaborate with one another so that their combined skills and insights add up to something more than the sum of their individual contributions.

Today's education is different from what it was two or three decades ago, of course. We surely spend more on education—about $300 billion in 1988 alone, which is almost 7 percent of our total annual output of goods and services, or about the same amount of money we spend on national defense.[5] Between the early 1950s and the mid-1980s, per pupil expenditures in American public schools tripled, as measured in constant dollars (although they have hardly increased at all since then).[6]

And we are getting a lot more education than before: Over 57 million of us are formally enrolled in schools and colleges, with millions more in job training and less formal educational activities. Three-quarters of our adults have completed high school; over 86 percent of younger adults in their twenties have done so—twice the percentage of 1940. Six out of ten of our high school graduates begin some form of more advanced education, and one-quarter of our younger adults have completed four years of college—up from 12 percent as recently as 1960.[7]

The quality of public education also has changed, particularly over the last several years. In 1983, the National Commission on Excellence in Education reported that American schools were failing to educate (23 million adults and 13 percent of our 17-year-olds were functionally illiterate); they compared badly with those of our trade competitors (our children came in last in 7 out of 19 academic tests, first or second in none); and they failed to teach our children the basics of American history and culture.[8] In response to this report and to others that followed, broad reforms have been initiated: All but five states have raised the minimum requirement for graduation from high school. Most states have also bolstered math and science curricula. Two dozen states, mainly in the South, have inaugurated comprehensive educational reforms including tightened standards, more academic discipline, and higher teacher salaries.[9] Forty states now have programs in technological education; New York even requires all junior high school students to take a year of introductory technology.[10] Efforts have been made to reduce truancy and dropout rates, introduce computer literacy and foreign

languages in the early years, establish after-school programs, require more basic academic courses for a high school diploma, extend the school year, and enhance job-readiness programs.

There have been modest gains. Although, as we shall see, standardized examinations are questionable criteria of success, they offer useful comparisons. In South Carolina, which in 1984 enacted one of the most comprehensive reforms, average Scholastic Aptitude Test scores have risen by 36 points. In Florida, where the high school day has been lengthened, SAT scores have increased modestly over the same period. In New York, which also imposed more stringent academic requirements, scores on the Pupil Evaluation Performance test for third graders rose from 77 to 79 percent. In California, the number of students taking three or more years of mathematics has increased by 15 percent and of science by 20 percent.[11]

But the task has just begun. The gains so far have been small. Education is so central to our place in the new world economy that we will have to do a better job—particularly in two respects: helping all our children to become minimally numerate and literate, and preparing them for jobs involving responsibility and collaboration. The challenge is not simply or even most importantly to provide our children with more education, but to provide them with a different kind of education founded upon new premises about the world they will meet in the future.

Basic Numeracy and Literacy

ALTHOUGH A HIGHER proportion of our young people are better prepared for productive lives than ever before, the worst-prepared third of our young people—disproportionately lower income—are almost totally unprepared. They cannot do simple calculations, understand written directions, or read road signs, charts and maps.[12] And they often lack certain basic information about history, literature, geography, and the natural sciences.[13]

These deficiencies are already affecting American business. When the New York Telephone Company undertook a large-scale recruiting effort in 1987, for example, it found that over 80 percent of its New York City applicants failed entry-level examinations in basic reading and reasoning skills. Some 1,700 of Polaroid's employees—about one-third of the firm's hourly work force—are enrolled in a company program teaching them elementary reading and writing. All told, one of three American corporations now provides some form of basic skills training for its employees. The American Society for Training and Development Study predicts that American industry will have to spend as much as $25 billion yearly on remedial education.

Perhaps we are too impatient—maybe the reforms need more time to take hold. Or perhaps they are inadequate to the task of dealing with all the problems that accompany poverty and broken homes. Twenty-two percent of our children are now born into poverty, up from 15 percent in 1970, and it is projected that 60 percent of today's 3-year-olds will live in a single-parent home before they turn 18.

Or it may be that formal schooling comes too late in the lives of our neediest children, by which time learning habits and attitudes are already firmly established. While there is overwhelming evidence that preschool programs designed to develop the intellectual and social skills of poor children have large payoffs later on, less than one-half of 1 percent of our national spending on education goes to children under the age of six.[14] Or perhaps the reforms have backfired upon the neediest: Stricter promotion and graduation requirements may have prompted more of them to drop out. In many of our largest cities, nearly half fail to graduate. Forty percent of Florida's students drop out, as do almost half of Louisiana's. Overall, between 15 and 25 percent of our young people never finish high school.[15]

Whatever the cause, raising the lowest achievers to minimal levels of productive competence is a large part of the challenge of American education in the next economy. Not only do we need a larger population of productive people to help pay off our international debt, but we also need them to support a growing population of retirees.

Responsibility

ACHIEVING BASIC NUMERACY and literacy is only part of the challenge. If our economy is to transform itself—if we are to take the second path, toward higher-value production—we can no longer train the majority of our young people for cog jobs requiring primarily discipline and reliability. They must be prepared to take advantage of whatever opportunities present themselves for improvements in product and process. To recognize such opportunities, they must be educated to think critically and to continually learn on the basis of new data and experience.

In some respects, the training of young people in the old economy resembled the system of high-volume, standardized production in which they were to take part when their training was complete: Responsibility was exercised by a very few, at the top. The majority of students were pushed, as if on an assembly line, through a preestablished sequence of steps. Each step involved particular routines and practices. Teachers—the production workers—had little discretion over what they had to do to each batch that passed through; students passively received whatever was doled out. Inspectors tried to weed out the defects, sometimes returning them to an earlier step for reworking. Most got to the end of the assembly line, more or less ready to take their places along real assembly lines somewhere in the economy.

The premises of education in the next economy must be quite different. Just as productivity can no longer be a matter of making more of what we already make at less cost per unit, productivity in education cannot be solely a function of the numbers of children who pass standardized examinations at a lower cost per unit. Because our future economy will depend to an ever greater extent on thinking rather than repeating learned information, future reforms must motivate teachers and students alike to love learning, and not prescribe to them exactly what should be learned and how and when the information should be doled out. Responsibility must be pushed downward, to students and teachers. They must be allowed and encouraged to take more initiative in deciding what is learned, and when and how it is learned. Education modeled around long lists of facts that "every adult should know" and standardized tests will produce robots adept at Trivial Pursuit but unable to think for themselves or to innovate for the future.

First, instead of giving students information along a preestablished sequence of steps, and then asking them to "play back" the information on tests, the emphasis in teaching should be on educating young people to formulate problems and questions for themselves. Thus, rather than teach students to assume that problems and solutions are generated by others (as they were under high-volume, standardized production), students should be taught to understand that problems and questions are created, that students can have an active role in creating them, and that such critical and creative approaches can guide them through their careers.[16]

Second, instead of teaching through repetition and drill, the emphasis should be on allowing students to experiment for themselves with solving the problems they help define. Thus, rather than conveying particular pieces of information or imposing established routines—a type of teaching and learning relevant to high-volume, standardized production—teachers must help students

gain the experience of working through problems, and thus discovering underlying principles that help define and solve related problems.

The difference between absorbing information and gaining understanding depends on how much responsibility students are taught to accept for their own continuing learning. It is like the difference between learning how to get from one location to another in a city by having someone drive you or by driving yourself with a guide sitting beside. In the first instance you may eventually learn the way, but you probably will learn sooner by being in the driver's seat. Indeed, if your guide also allows you to experiment a bit, warning you only when you're going down blind alleys or heading in the wrong direction, you may gain even more understanding of the terrain, and thus learn how to find other places as well.[17]

An understanding of underlying principles and patterns allows discovery of other information, and gives that new information added context and meaning. The new information, in turn, permits deeper insight into the principles and patterns. As Michael Polanyi has written, "[w]e cannot comprehend the whole without seeing its parts, but we cannot see the parts without comprehending the whole."[18]

The habits and techniques of experimentation—of iterative discovery of parts and wholes—will be critical in the next economy, where technologies, tastes, and markets are likely to be in constant flux. Informal, on-the-job education will be a central aspect of work. Formal education and training will no longer be limited to young people, but will be available on a continuing basis to workers throughout their working lives—an accepted and expected aspect of one's career. A work force capable of taking responsibility for its own continuous learning will prove a more precious national asset than countless new factories and equipment.

Collaboration

SPECIALIZED SKILLS ALSO will be needed, of course. More of our young people will have to be able to communicate in foreign languages (for every American who now speaks Japanese, there are at least ten Japanese who speak English), and gain a working knowledge of foreign nations and cultures. More of them will need advanced education in mathematics, science, and engineering. (Despite a growing need, fewer bachelor's degrees were awarded in science and engineering in 1987 than on average during the 1970s.) There will be a greater need for people who can cross disciplines—from, say, physics to computer programming, from biology to Chinese language and culture.

But our culture has never had much difficulty educating the most talented and fortunate fifth of our young people to do complex intellectual tasks. Analytically sophisticated students already graduate from our universities, trained for narrow specialties in which they manipulate symbols and concepts in wonderous ways. We may want to change the mix somewhat—more engineers and foreign experts, fewer lawyers and financiers—but there is no fundamental problem mustering talented people and getting them educated. The greater challenge is to transform the individual talents and specialized skills of the top 20 percent into collective capacities broadly shared across American enterprise.

In the old economy, a relatively few people at the top could analyze and plan the production process by themselves, and then issue operating instructions to everyone else. So long as professional managers and their professional aides—bankers, lawyers, accountants, and engineers—got it "right" on paper, it was assumed that the rest would follow automatically. But paper professionals are far less relevant to the future. As we have seen, the weakest link in the American economy is between ideas and implementation, between paper and product. Thus if our business enterprises are to be as flexible and innovative at all levels as they need to be, our youngsters must be prepared to work with and through large numbers of people. While there will always be a need for a certain number of solo practitioners, the more usual requirement will be that combinations of individual skills are greater than their sums. Most of the important work will be done by groups, rather than by individual experts.

Learning to collaborate suggests a different kind of education than one designed to prepare a relatively few talented young people to become professional experts. Instead of emphasizing the quiet and solitary performance of specialized tasks, a greater emphasis should be placed on interactive communications linked to group problem-definitions and solutions.[19] Students should learn to articulate, clarify, and then restate for one another how they determine questions and find answers. Rather than be trained to communicate specialized instructions and requests—skills relevant to high-volume standardized production—students should learn how to share their understandings, and build upon each others' insights.[20]

Communication skills are only one aspect of collaboration. Young people also must be taught how to work constructively together. Instead of emphasizing individual achievement and competition, the emphasis in the classroom should be on group performance. Students

need to learn how to seek and accept criticism from their peers, to solicit help, and to give credit to others, where appropriate. They must also learn to negotiate—to articulate their own needs, to discern what others need and see things from others' perspectives, and to discover mutually beneficial outcomes.

The "tracking" system, by which students are grouped in the classroom according to the speed of their learning, is another vestige of high-volume, standardized production—the deluxe models moving along a different conveyor belt from the economy cars. This may be an efficient way to cram information into young minds with differing capacities to absorb it; but tracking or grouping can also reduce young peoples' capacities to learn from and collaborate with one another. Rather than separate fast learners from slow learners in the classroom, all children (with only the most obvious exceptions) should remain together, so that class unity and cooperation are the norm. Faster learners would thus learn how to help the slower ones, while the slower ones would be pushed harder to make their best effort.[21]

In sum, it is not enough to produce a cadre of young people with specialized skills. If our enterprises are to be the scenes of collective entrepreneurship—as they must be—experts must have the ability to broadly share their skills and transform them into organizational achievement; and others must be prepared to learn from them.

The Danger of Fragmentation

NUMERACY, LITERACY, RESPONSIBILITY, and collaboration: this is a tall order for public education. But it is a necessary one if we are to succeed in the world economy in coming years. It will require that we do in our schools what we must do in our business enterprises: push responsibility downward toward teachers and students; invite continuous, incremental innovation at all levels; foster collaboration among parents, teachers, principals, community groups, and the private sector; and encourage flexibility.[22]

Meeting the challenge also requires that we invest substantially in one another. We will have to pay more to educate our children—especially to attract and retrain talented teachers to do the educating. Between 1987 and 1993, American schools must recruit some 1.3 million new teachers—over half of the current force. According to present trends, the labor market will not meet this need. The choice will be either to lower recruitment standards or to raise teachers' salaries. The former choice will be far more costly to the nation than the latter. (It is worth noting in this regard that starting pay for Japanese school teachers exceeds that for any other public servants in Japan, and is higher than or equal to that of engineers.) Teachers and educational administrators, in turn, will have to accept even more accountability.

We also will have to bear more of the cost of educating our fellow citizens before and after their formal schooling. If our children are to be adequately prepared for school, Head Start and other preschool programs for ages 3 and 4, and day care for toddlers, must become the norm. If our older workers are to be adequately prepared for jobs that are continuously changing, they must have easy access to retraining and continuing education.[23]

Do we have the will to make the needed investments and undertake the necessary changes? Much depends on the extent to which we consider ourselves one people whose fates are linked.

I have before emphasized our choice of path toward the next economy—either cutting labor costs or increasing labor value. The first path will result in a lower standard of living for most Americans; the second requires that we all sacrifice in the short term in order to reap long-term gains. It should be noted, however, that the fates of our most talented and fortunate citizens are not necessarily linked to the educational attainments of the rest. The new world economy makes it possible for the top fifth of our population to sell their expertise directly in the global market, and thus maintain their standard of living and that of their children, even as that of other Americans declines. Improvements in the technologies of communications and transportation are facilitating the development of global corporations, partnerships, and consulting businesses that transcend the organization of production within any single nation. The most talented and fortunate fifth—sitting astride these global businesses—are thus losing any unique connection to the American economy.

There are signs that a two-tier society is already developing. Increasingly, our largest cities are inhabited by paper professionals at the top—lawyers, financiers, con-

sultants, managers—and by unskilled service workers at the bottom—sales clerks, fast-food employees, custodians, hospital orderlies, cab drivers. Nationally, the gap appears to be widening. For 80 percent of American families, the last decade was a time of declining real income. But the wealthiest fifth of our population experienced no decline. In fact, the richest tenth enjoyed an increase of about 16 percent; the top twentieth, an increase of 23 percent; and the real income of America's richest 1 percent rose 50 percent.[24] Since 1980 the median income of a married couple, each of whom has had five or more years of education beyond high school, has risen to $61,130; the median income of a couple with only high school degrees has risen more slowly, to $36,888. Since 1980 the bottom fifth of the income distribution has lost, on average, one dollar out of every six in earnings, while the top fifth has increased its share of total national income by 8 percent.[25]

Without the active support of the most talented and fortunate fifth of our population, however, it will be difficult to muster the political will necessary to change the present direction. But unless we change, the gap between the top fifth and the rest of us will widen further; and most Americans will continue to grow poorer. Therein lies one of the sharpest dilemmas of our time.

Notes

[1]"[H]owever deserving of attention may be the *economical* view of the subject which I have endeavored to present, yet it is one that dwindles into insignificance when compared to those loftier and more sacred attributes of the cause." Horace Mann, *Fifth Annual Report of the Board of Education* (Boston: Board of Education, 1842).

[2]For a more detailed description of this stable production system, see my *The Next American Frontier* (New York: Penguin Books, 1983).

[3]Almost one-fifth of the growth in net national product per worker between 1948 and 1973 was a result of increased education of the work force. See Edward Denison, "The Interruption of Productivity Growth in the United States," *The Economic Journal* 93 (1983).

[4]See my "Entrepreneurship Reconsidered: The Team as Hero," *Harvard Business Review* 65, no. 3 (May-June 1987).

[5]In 1987, about $184 billion was spent for public and private elementary and secondary schools, about $124 billion for colleges and universities. For these and related data, see Center for Educational Statistics, U.S. Department of Education, *Digest of Educational Statistics 1986-1987* (Washington, D.C.: Government Printing Office); U.S. Bureau of the Census, *Educational Attainment in the United States*, Current Population Reports, Series P-25 (Washington, D.C.: the Bureau, various years).

[6]Between 1980 and 1986, states and local school districts increased their educational expenditures by about $4.2 billion, in constant dollars, while the federal government's contribution declined by approximately the same amount. *Digest of Educational Statistics 1986-1987*. See also, National Education Association, *Estimates of School Statistics, 1985-1986* (Washington, D.C.: the Association, 1987).

[7]See U.S. Bureau of the Census, *Educational Attainment in the United States*, Current Population Reports (Washington, D.C.: the Bureau, 1986, 1987).

[8]National Commission on Excellence in Education, *A Nation at Risk* (Washington, D.C.: U.S. Government Printing Office, 1983).

[9]As recently as 1980, 10 of 15 states belonging to the Southern Regional Education Board required no more than one year of high school science. Now every state requires at least two years, and several require three.

[10]"Reading, 'Riting, and 'Rithmetic and Now Technological Education," *Business Week* (October 19, 1987): 114.

[11]As reported in the *New York Times*, August 8, 1987, A14.

[12]See, for example, Irwin S. Kirsch and Ann Jungeblut, *Literacy: Profiles of America's Young Adults* (Princeton: Educational Testing Service, 1986).

[13]See, for example, Chester Finn, Jr. and Diane Ravitch, *What Do Our 17-Year-Olds Know?* (New York: Harper & Row, 1987); Committee for Economic Development, *Children in Need: Investment Strategies for the Educationally Disadvantaged* (New York: 1987).

[14]The Committee for Economic Development, op. cit., recommends that more emphasis be placed on preventing teenage pregnancy, providing better nutrition and medical care to poor pregnant women, giving them advice on parenting, providing better postnatal care for high-risk mothers, and making quality child care and preschool programs more available. On the economic effects of preschool education, see, for example, J. R. Berreuta-Clement et al., *Changed Lives: The Effects of the Perry Pre-School Program on Youths Through Age Nineteen* (Ypsilanti, Mich.: High/Scope Press, 1984).

[15]Only one in four finishes high school on schedule; there are no clear data on how many who do not finish on schedule finish later on.

[16]A description of this method of teaching question-raising can be found in Marcia Heiman, "Learning to Learn: A Behavioral Approach to Improving Thinking." Paper presented at the Harvard Conference on Thinking, Cambridge, Mass., 1984.

[17]There is a rich literature on "experiential" learning. See, for example, D. A. Kolb, "On Management and the Learning Process," in *Organizational Psychology: A Book of Readings*, 2d ed., edited by D. Kolb et al. (Englewood Cliffs, N.J.: Prentice-Hall, 1974); Arthur Whimbey and Jack Lockhead, *Problem Solving and Comprehension* (Philadelphia: Franklin Institute Press, 1982); Lillian C. McDermott, "Helping Minority Students Succeed in Science," *Journal of College Science Teaching* (January, March, and May 1980).

[18]Michael Polanyi, *The Study of Man* (Chicago: University of Chicago Press, 1958), 29.

[19]The emphasis in Japanese schools upon teamwork in the classroom is thought to explain Japan's low rates of absenteeism on the job, and its firms' quick responsiveness to new opportunities. See Banjamin Duke, *The Japanese School: Lessons for Industrial America* (New York: Praeger, 1986).

[20]See generally, Ernest L. Boyer, "Reflecting on the Great Debate of '83," *Phi Delta Kappan* (March 1984); Boyer, *High School* (New York: Harper & Row, 1983).

[21]Japanese children are not grouped or "tracked"; the assumption in the Japanese classroom is that it is better for all the children to have the class as a whole progress together. See Mary White, *The Japanese Educational Challenge: A Commitment to Children* (New York: Free Press, 1987).

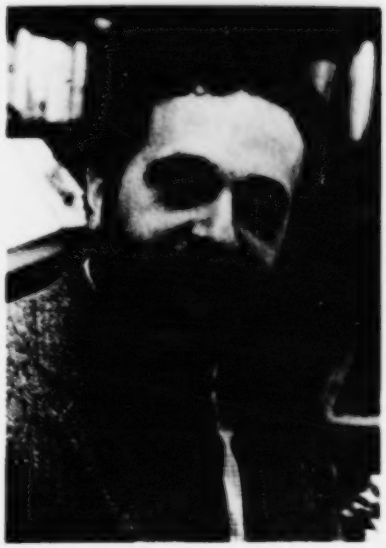
[22]See generally, Judith Little, "Norms of Collegiality and Experimentation: Workplace Conditions and School Success," *American Educational Research Journal* 19, no. 3 (Fall 1982).

[23]The sacrifices we will be called on to make in the years ahead are not only pecuniary, of course. We will have to spend more time with our children and perhaps with other children as well. It will be necessary for us to work closely with our childrens' teachers and principals. We will need to join with other parents to ensure both that the schools are meeting our expectations and that our childrens' lives outside of school are adequately stimulating and emotionally and physically secure.

[24]Calculated from data supplied by the Congressional Budget Office, November 1987. See also Frank Levy, *Dollars and Dreams: The Changing American Income Distribution* (New York: Basic Books, 1988). In 1969, a man three-quarters of the way up the income ladder earned $28,639 (in 1984 dollars); a fellow worker at the 25th percentile earned $8,981. The ratio between them was about 3 to 1. But in 1984, the ratio between them became 4 to 1.

[25]Calculated from data from the U.S. Department of Labor, Bureau of Labor Statistics.

Robert B. Reich



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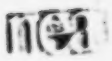

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